AREI UPDATES: Tillage and Cropping on HEL

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Tillage and Cropping Systems on Highly Erodible Land

- **Land designated as highly erodible (HEL) made up just over one-fifth of the 1994 surveyed acreage in four major field crops (corn, cotton, soybeans, and wheat).**
- **Farmers' overall use of conservation tillage systems on the four major crops was higher on HEL (43% in 1994) than on non-HEL (33%). For 1990-93 corn and soybeans, the rate of growth in conservation tillage was also greater on HEL.**
- **Corn and wheat farmers in 1994 were more likely than soybean and cotton farmers to follow crop rotations that idled their HEL fields or planted them to soil-conserving crops.**

Conservation tillage and cropping systems reduce soil erosion and are increasingly being used on both HEL and non-HEL. Conservation plans, which farmers were to have fully implemented on HEL by 1995 to qualify for farm program benefits, specify the use of conservation tillage or other crop residue management systems on about 75% of the HEL planted to crops. The annual Cropping Practices Survey (CPS) provides information on how tillage and other cropping systems have changed in recent years on both HEL and non-HEL.

For corn and soybeans, the growth of conservation tillage systems has been greater on HEL than non-HEL, while for wheat and cotton there has been little change in the use of these systems in the last five years (tables 1 and 2). Conservation tillage and other crop residue management systems are being adopted on many farms for their cost savings as well as for soil conservation. Fuel and labor savings, lower machinery investments, and long term benefits to soil structure and fertility are commonly cited advantages over conventional tillage systems.

About one-fifth of the corn acres represented in the 1994 CPS was designated as HEL, with 56 percent of that acreage planted using conservation tillage. The share of HEL using no-till or ridge-till increased from 7 percent in 1989 to 34 percent in 1994. Over 64 percent of northern soybean HEL acres were planted using conservation tillage in 1994, up from 28 percent in 1989. About one-fourth of the winter wheat and a slightly higher share of spring wheat were produced with conservation tillage on HEL. Conservation tillage systems were not widely used on either HEL or non-HEL cotton acreage in the survey.

Most of the corn, soybeans, and cotton are either in a monoculture or a continuous row crop sequence on both HEL and non-HEL (table 3). However, soil-conserving crops grown in sequence with corn are more prevalent on HEL and account for about 22 percent of the 1994 acreage. For soybeans, previous soil-conserving crops were grown on about 20 percent of the acreage, with little difference between HEL and non-HEL. For cotton, soil-conserving crops were more prevalent on non-HEL.

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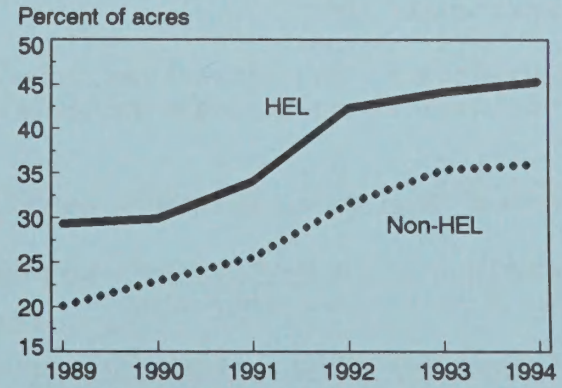
About AREI UPDATES

AREI UPDATES is a periodic series which supplements and updates information in **Agricultural Resources and Environmental Indicators (AREI), AH-705, USDA, ERS, Dec. 1994. UPDATES** report recent data from surveys of farm operators and others knowledgeable about changing agricultural resource use and conditions, with only minimal interpretation or analysis. Please contact the individual listed at the end of the text for additional information about the data in this **UPDATE.** If you would like to be added to the mailing list or have other questions about **AREI UPDATES** or **AREI,** contact Richard Magleby, (202) 219-0436.

Conservation tillage use on major field crops*



* Includes Corn, Soybeans, and All Wheat
Source: USDA, ERS, Cropping Practices Survey Data

Cropping Practices Survey

The Cropping Practices Survey collects annual data on fertilizer and pesticide use, tillage systems, crop sequence, and information on other inputs and cultural practices. Fertilizer information has been reported from these surveys since 1964. In the mid-1980's, pesticide use, tillage operations, and prior crop questions were added to the survey. Integrated pest management and nutrient management questions have recently been included.

The 1994 survey included corn, cotton, soybeans, wheat, and potatoes and represented about 167 million acres. This area includes the acreage in major producing States, which account for about 80 percent of the total U.S. acreage for these crops. Because of priority data needs and available survey funds, the number of crops and States have changed, but the following crops and States have consistently been included in the recent surveys.

Corn:	IL, IN, IA, MI, MN, MO, NE, OH, SD, and WI
Soybeans:	AR, IL, IN, IA, MN, MO, NE, and OH
Cotton:	AR, AZ, CA, LA, MS, and TX
Winter wheat:	CO, ID, IL, KS, MO, MT, NE, OH, OK, OR, SD, TX, and WA
Other spring wheat:	MN, MT, ND, and SD
Durum wheat:	ND

Through a stratified sampling procedure, a random acre is selected as a sample. Since the random acre within a field is not identified, respondents are asked to provide field level information. The operator of the selected sample field is asked to report all fertilizer and nutrient treatments, all tillage operations prior to planting, crops planted in the previous 2 years, and data on other inputs and cultural practices. The operator also identifies whether the field has been designated as highly erodible land (HEL) by the Natural Resources Conservation Service and whether the farm unit participates in Federal price support programs.

Estimates for five tillage systems are based on the use of specific tillage implements and their residue incorporation rates. Estimates of crop rotations are based on the crop planted on the selected sample during the previous 2 years. The Cropping Practices Survey does not collect sufficient information to determine if fields meet compliance requirements. Also limiting the crop rotation to a 3-year sequence may overstate acreage in monoculture or continuous-row crops. The most recent crops in a rotation, however, have the greatest potential effect on nutrient and pesticide needs of subsequent crops.

Tillage Systems

Conservation Tillage Systems (as defined in the Cropping Practices Survey)

Mulch tillage—The soil is disturbed prior to planting. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used. The Cropping Practices Survey assumes any system with 30 percent or more residue after planting that is not a no-till or ridge till system is a mulch till system.

Ridge tillage—The soil is left undisturbed from harvest to planting except for nutrient injection. Planting is completed in a seedbed prepared on ridges with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges.

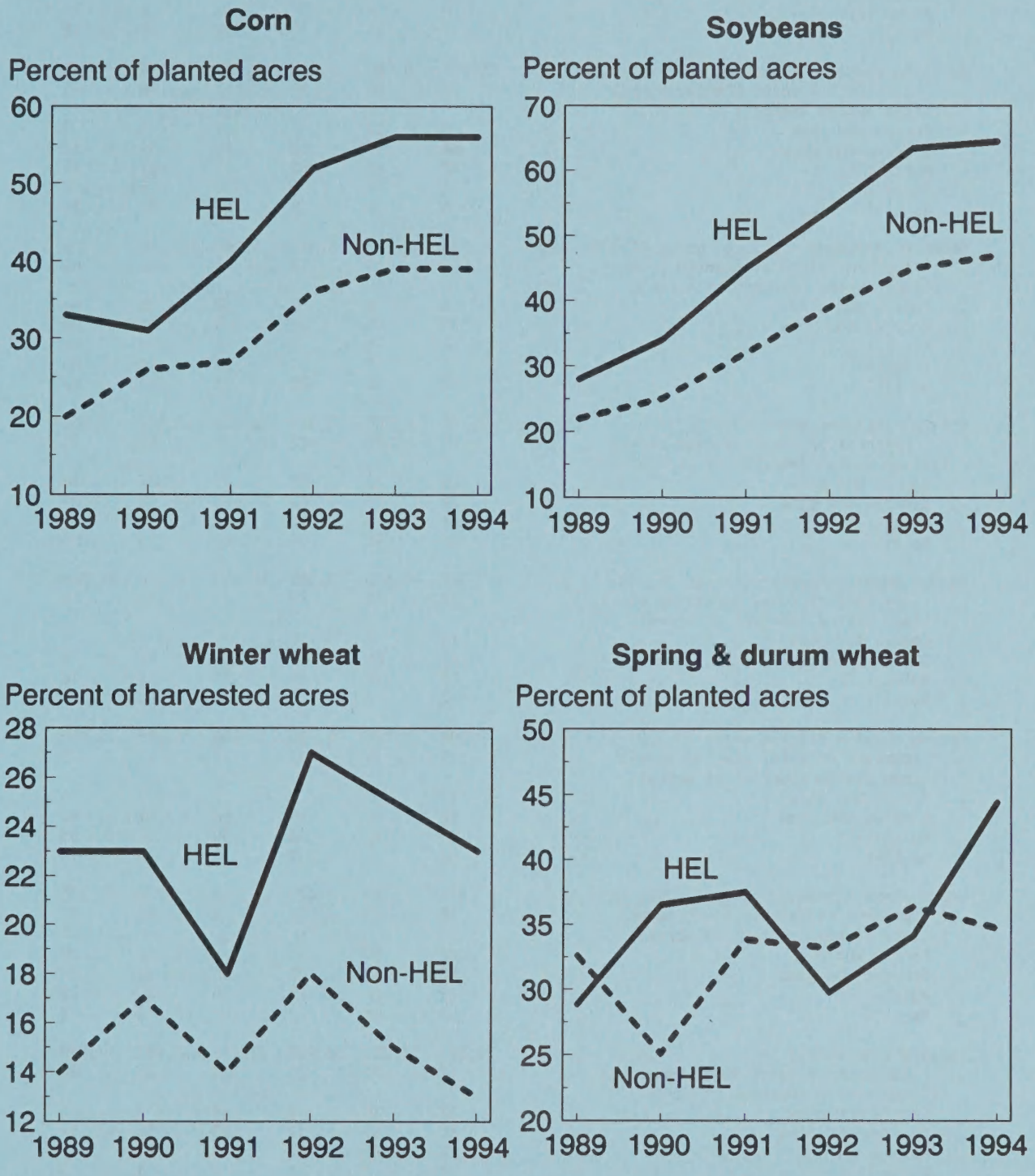
No-tillage—The soil is left undisturbed from harvest to planting except for nutrient injection. Planting or drilling is accomplished in a narrow seedbed or slot created by coulters, row cleaners, disk openers, inrow chisels, or roto-tillers.

Conventional Tillage Systems (as defined in the Cropping Practices Survey)

Conventional tillage with moldboard plow—Any tillage system that includes the use of a moldboard plow and has less than 30 percent residue after planting.

Conventional tillage without moldboard plow—Any tillage system that has less than 30 percent remaining residue and does not use a moldboard plow.

Conservation Tillage Use



Source: USDA, ERS, Cropping Practices Survey.

Note: Crops surveyed in major producing states. See box "Cropping Practices Survey" for states included.

Table 1--Tillage systems used in field crop production on highly erodible lands, major producing States, 1989-94

Category	1989	1990	1991	1992	1993	1994
Corn - planted acres (1,000) 1/	10,540	12,700	13,300	12,460	11,295	11,910
(percent of total planted acres)	18	22	22	20	20	19
Tillage system (percent of acres):						
Conv/w mbd plow	16	12	9	10	7	6
Conv/wo mbd plow	51	56	51	39	37	38
Mulch-till	26	20	26	30	25	22
Ridge-till	*	*	*	2	2	2
No-till	7	11	14	20	29	32
Northern soybeans - planted acres (1,000) 1/2/	5,305	7,180	7,230	6,700	7,540	7,705
(percent of total planted acres)	14	20	19	17	18	18
Tillage system (percent of acres):						
Conv/w mbd plow	8	10	5	4	3	3
Conv/wo mbd plow	64	57	50	42	34	32
Mulch-till	22	28	30	31	27	25
Ridge-till	*	*	*	id	(.5)	(.5)
No-till	6	6	15	23	36	39
Southern soybeans - planted acres (1,000) 1/2/	996	1,160	1,060	1,160	na	na
(percent of total planted acres)	7	10	10	11	na	na
Tillage system (percent of acres):						
Conv/w mbd plow	4	6	3	2	na	na
Conv/wo mbd plow	50	48	66	40	na	na
Mulch-till	8	6	3	6	na	na
Ridge-till	*	*	*	id	na	na
No-till	38	40	28	52	na	na
Cotton - planted acres (1,000) 1/	2,102	2,100	2,355	2,085	2,832	2,560
(percent of total planted acres)	25	22	22	20	23	26
Tillage system (percent of acres):						
Conv/w mbd plow	28	22	32	12	37	18
Conv/wo mbd plow	72	77	61	88	58	81
Mulch-till	nr	id	3	nr	id	id
No-till	nr	id	4	nr	5	nr
Winter wheat - harvested acres (1,000) 1/ 3/	7,545	11,610	10,185	11,580	12,560	11,840
(percent of total harvested acres)	22	29	30	31	34	34
Tillage system (percent of acres):						
Conv/w mbd plow	10	8	8	9	3	7
Conv/wo mbd plow	67	68	74	64	72	70
Mulch-till	21	20	14	23	19	16
No-till	2	3	4	4	6	7
Spring wheat - planted acres (1,000) 1/	2,502	2,390	2,330	2,950	3,625	3,620
(percent of total planted acres)	15	15	17	17	21	21
Tillage system (percent of acres):						
Conv/w mbd plow	12	3	5	3	1	6
Conv/wo mbd plow	58	59	55	66	65	49
Mulch-till	30	32	38	30	22	35
No-till	nr	6	2	1	12	10
Durum wheat - planted acres (1,000) 1/	403	95	470	180	230	275
(percent of total planted acres)	13	3	16	8	12	12
Tillage system (percent of acres):						
Conv/w mbd plow	nr	50	5	nr	nr	nr
Conv/wo mbd plow	78	50	70	90	64	64
Mulch-till	22	nr	25	10	22	29
No-till	nr	nr	nr	nr	14	7
Total (1,000 acres)	29,393	37,235	36,930	37,115	38,082	37,910
(percent of total surveyed acres)	17	21	22	21	23	22
Tillage system (percent of acres):						
Conv/w mbd plow	13	10	9	8	7	6
Conv/wo mbd plow	60	61	59	53	52	51
Mulch-till	22	21	22	25	21	21
Ridge-till	*	*	*	1	1	1
No-till	5	7	10	14	19	21

id = Insufficient data. nr = None reported. na = not available, see footnote 2.

* = Included in no-till for these years.

1/ Preliminary. For States included see box "Cropping Practices Survey." 2/ Arkansas in 1993 and 1994 is included in northern area. Previously Arkansas was included with GA, KY, LA, MS, NC, and TN (not surveyed in 1993 or 1994) to comprise the southern area. 3/ Arkansas and Indiana not included in 1993 or 1994.

Source: USDA, ERS, Cropping Practices Surveys, 1989-1994

Table 2--Tillage systems used in field crop production on non-highly erodible lands, major producing States, 1989-94

Category	1989	1990	1991	1992	1993	1994
Corn - planted acres (1,000) 1/	41,020	43,230	44,480	46,880	43,355	48,580
(percent of total planted acres)	71	74	74	75	75	78
Tillage system (percent of acres):						
Conv/w mbd plow	19	18	15	12	9	9
Conv/wo mbd plow	61	57	58	52	52	52
Mulch-till	15	18	18	24	23	23
Ridge-till	*	*	*	2	4	3
No-till	5	8	9	10	12	13
Northern soybeans - planted acres (1,000) 1/2/	29,193	27,450	29,930	29,680	33,625	34,800
(percent of total planted acres)	77	75	77	78	79	80
Tillage system (percent of acres):						
Conv/w mbd plow	29	26	20	15	9	10
Conv/wo mbd plow	49	49	48	48	46	44
Mulch-till	18	20	23	26	25	25
Ridge-till	*	*	*	1	1	1
No-till	4	5	9	12	19	21
Southern soybeans - planted acres (1,000) 1/2/	10,088	9,160	8,810	8,170	na	na
(percent of total planted acres)	76	77	81	78	na	na
Tillage system (percent of acres):						
Conv/w mbd plow	2	3	2	3	na	na
Conv/wo mbd plow	88	80	84	81	na	na
Mulch-till	4	8	6	8	na	na
Ridge-till	*	*	*	id	na	na
No-till	6	9	8	8	na	na
Cotton - planted acres (1,000) 1/	4,956	6,930	7,590	7,030	7,063	6,363
(percent of total planted acres)	59	71	70	69	68	63
Tillage system (percent of acres):						
Conv/w mbd plow	9	10	17	7	9	7
Conv/wo mbd plow	90	88	82	92	91	92
Mulch-till	id	1	1	id	id	nr
No-till	id	1	nr	nr	nr	1
Winter wheat - harvested acres (1,000) 1/ 3/	21,672	25,660	21,940	23,990	23,130	21,995
(percent of total harvested acres)	62	64	64	65	62	64
Tillage system (percent of acres):						
Conv/w mbd plow	20	13	14	12	7	9
Conv/wo mbd plow	66	70	72	70	78	78
Mulch-till	13	15	12	15	12	10
No-till	1	2	2	3	3	3
Spring wheat - planted acres (1,000) 1/	12,557	12,010	10,800	13,960	13,055	12,910
(percent of total planted acres)	76	76	80	80	77	75
Tillage system (percent of acres):						
Conv/w mbd plow	6	13	7	9	11	8
Conv/wo mbd plow	64	64	61	59	55	59
Mulch-till	30	21	29	24	27	30
No-till	id	2	3	8	7	4
Durum wheat - planted acres (1,000) 1/	2,217	2,505	2,345	1,970	1,670	2,155
(percent of total planted acres)	71	81	78	90	86	86
Tillage system (percent of acres):						
Conv/w mbd plow	4	3	5	8	3	1
Conv/wo mbd plow	49	62	53	50	54	60
Mulch-till	46	34	38	39	39	33
No-till	1	1	4	3	4	6
Total (1,000 acres)	121,703	126,945	125,795	131,680	121,898	126,803
(percent of total surveyed acres)	71	72	74	74	73	74
Tillage system (percent of acres):						
Conv/w mbd plow	18	16	14	11	9	9
Conv/wo mbd plow	63	62	61	59	58	58
Mulch-till	16	17	18	21	21	21
Ridge-till	*	*	*	1	2	1
No-till	3	5	7	8	11	11

id = Insufficient data. nr = None reported. na = not available, see footnote 2.

* = Included in no-till for these years.

1/ Preliminary. For States included see box "Cropping Practices Survey." 2/ Arkansas in 1993 and 1994 is included in northern area. Previously Arkansas was included with GA, KY, LA, MS, NC, and TN (not surveyed in 1993 or 1994) to comprise the southern area. 3/ Arkansas and Indiana not included in 1993 or 1994.

Source: USD, ERS, Cropping Practices Surveys, 1989-1994

Table 3--Erodibility distribution of crop acreage by crop rotations, major producing States, 1994

Category	Corn	Soybeans	Cotton	Winter wheat 1/	Spring wheat	Durum wheat	Total
Planted acres (1,000) 2/	62,500	43,750	10,023	34,590	17,250	2,450	170,563
Erodibility:				percent of planted acres			
Highly erodible land	19	18	26	34	21	12	22
Land not highly erodible	78	79	63	64	75	86	74
Land not designated	3	3	11	2	4	2	3
Three-year crop sequence on HEL:				percent of HEL planted acres			
Continuous same crop	23	5	76	35	13	29	25
Continuous row crops	55	75	20	nr	nr	nr	34
Continuous small grains	nr	nr	nr	id	7	nr	id
Row crop and small grains 3/	4	7	1	9	13	nr	7
Idle or fallow in rotation	10	9	2	56	64	64	29
Hay or other crops in rotation	8	4	1	id	3	7	4
Three-year crop sequence on non-HEL:				percent of non-HEL planted acres			
Continuous same crop	21	7	68	47	18	26	24
Continuous row crops	62	72	21	nr	nr	nr	45
Continuous small grains	nr	nr	nr	id	11	15	1
Row crop and small grains	4	12	3	12	41	12	11
Idle or fallow in rotation	9	6	6	40	27	41	16
Hay or other crops in rotation	4	3	2	1	3	6	3

nr = None reported. id = Less than 1 percent.

1/ Harvested acres for winter wheat only. 2/ Preliminary. For the States included, see box "Cropping Practices Survey." 3/ Includes double-cropped soybeans.
Source: USDA, ERS, 1994 Cropping Practices Survey

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